

### AMENDMENTS TO THE CLAIMS

1. (Currently amended) A method of screening a plurality of drug candidate compounds against a target ion channel comprising:

expressing said target ion channel in a population of host cells;

placing a plurality of said host cells into each of a plurality of sample wells;

adding a candidate drug compound to at least one of said plurality of sample wells;

affecting the target ion channel by modulating a transmembrane potential of said host cells in said at least one well with an application of a series of electric field pulses applied with extracellular electrodes extending down into said at least one well so as to set said transmembrane potential to a level suitable for a specific ion channel activation state or transition between states ~~to a level corresponding to a pre-selected voltage dependent state of said target ion channel~~, wherein the frequency of the electric field pulses ( $f$ ) is within the range  $\tau_M^{-1} \leq f \leq \tau_b^{-1}$  where  $\tau_M$  is a time constant for decay of transmembrane potential changes, and  $\tau_b$  is an average target ion channel open time, wherein the pulses at said frequency cause a sustained transmembrane potential change via a stepwise accumulation or loss of ions ~~gradual change in transmembrane potential~~ over the course of said series of pulses; and

detecting transmembrane potential characteristics of said plurality of cells over an area of observation in said at least one well to detect an effect of said candidate drug compound on said target ion channel.

2. (Original) The method of Claim 1, additionally comprising selecting a host cell line having a normal resting transmembrane potential corresponding to a second pre-selected voltage dependent state of said target ion channel.

3. (Original) The method of Claim 1, wherein said electric fields are biphasic.

4. (Previously presented) The method of Claim 1, wherein electric fields cause said target ion channel to cycle between different voltage dependent states.

5. (Previously presented) The method of Claim 1, wherein said electric fields cause said target ion channel to open.

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6. (Previously presented) The method of Claim 1, wherein said electric fields cause said target ion channel to be released from inactivation.

7. (Previously presented) The method of Claim 1, wherein said plurality of said host cells comprise a voltage sensor selected from the group consisting of a FRET based voltage sensor, an electrochromic transmembrane potential dye, a transmembrane potential redistribution dye, an ion sensitive fluorescent or luminescent molecule and a radioactive ion.